What is claimed is:

[Claim 1] A method of processing a dielectric film, the method comprising:

providing a substrate having a fluoro-carbon dielectric film deposited thereon, the film having an exposed surface containing contaminants; and

treating the exposed surface with a supercritical carbon dioxide fluid to clean the exposed surface of the contaminants and provide surface termination.

[Claim 2] The method according to claim 1, wherein the contaminants comprise CH_x, H_2O, OH, or HF, or a combination of two or more thereof.

[Claim 3] The method according to claim 1, wherein the supercritical carbon dioxide fluid further comprises a solvent.

[Claim 4] The method according to claim 3, wherein the solvent comprises an alcohol or a silicon-containing chemical, or a combination thereof.

[Claim 5] The method according to claim 4, wherein the alcohol comprises methanol, ethanol, propanol, or butanol, or a combination of two or more thereof.

[Claim 6] The method according to claim 4, wherein the silicon-containing chemical comprises hexamethyldisilane, hexamethyldisilazane, dimethylsilyldiethylamine, tetramethyldisilazane, trimethylsilyldimethylamine, dimethylsilyldimethylamine, trimethylsilyldiethylamine, bis-trimethylsilyl-urea, bis(dimethylamino)methyl silane, bis(dimethylamino)dimethyl silane, dimethylaminopentamethyldisilane, or dimethylaminodimethyldisilane, or a combination of two or more thereof.

[Claim 7] The method according to claim 1, wherein the surface termination comprises C-F functional groups or Si–Me_3 functional groups.

[Claim 8] The method according to claim 1, wherein the treating comprises:

performing a first treatment wherein the supercritical carbon dioxide fluid contains an alcohol; and

performing a second treatment wherein the supercritical carbon dioxide fluid contains a silicon-containing chemical.

[Claim 9] The method according to claim 8, wherein the alcohol comprises methanol, ethanol, propanol, or butanol, or a combination of two or more thereof.

[Claim 10] The method according to claim 8, wherein the silicon-containing chemical comprises hexamethyldisilane, hexamethyldisilazane, dimethylsilyldiethylamine, tetramethyldisilazane, trimethylsilyldimethylamine, dimethylsilyldimethylamine, trimethylsilyldiethylamine, bis-trimethylsilyl-urea, bis(dimethylamino)methyl silane, bis(dimethylamino)dimethyl silane, dimethylaminopentamethyldisilane, or dimethylaminodimethyldisilane, or a combination of two or more thereof.

[Claim 11] The method according to claim 1, wherein the fluoro-carbon film comprises a nitrated fluoro-carbon film.

[Claim 12] The method according to claim 1, further comprising:

depositing a metal-containing film onto the treated surface of the fluoro-carbon film, wherein the surface termination improves adhesion of the metal-containing film to the fluoro-carbon film.

[Claim 13] The method according to claim 10, wherein the metal-containing film comprises tantalum.

[Claim 14] A method of processing a dielectric film, the method comprising:

providing a substrate having a patterned fluoro-carbon dielectric film formed thereon, the patterned fluoro-carbon dielectric film having one or more vias or trenches, or a combination thereof, and the patterned fluoro-carbon dielectric film having an exposed surface containing contaminants; and

treating the exposed surface with a supercritical carbon dioxide fluid to clean the exposed surface of the contaminants and provide surface termination.

[Claim 15] The method according to claim 14, wherein the contaminants comprise CH_x, H_2O, OH, or HF, or a combination of two or more thereof.

[Claim 16] The method according to claim 14, wherein the supercritical carbon dioxide fluid further comprises a solvent.

[Claim 17] The method according to claim 16, wherein the solvent comprises an alcohol or a silicon-containing chemical, or a combination thereof.

[Claim 18] The method according to claim 17, wherein the alcohol comprises methanol, ethanol, propanol, or butanol, or a combination of two or more thereof.

[Claim 19] The method according to claim 17, wherein the silicon-containing chemical comprises hexamethyldisilane, hexamethyldisilazane, dimethylsilyldiethylamine, tetramethyldisilazane, trimethylsilyldimethylamine, dimethylsilyldimethylamine, trimethylsilyldiethylamine, bis-trimethylsilyl-urea, bis(dimethylamino)methyl silane, bis(dimethylamino)dimethyl silane, dimethylaminopentamethyldisilane, dimethylaminodimethyldisilane, or a combination of two or more thereof.

[Claim 20] The method according to claim 14, wherein the surface termination comprises C-F functional groups or Si–Me_3 functional groups.

[Claim 21] The method according to claim 14, wherein the treating comprises:

performing a first treatment wherein the supercritical carbon dioxide fluid contains an alcohol; and

performing a second treatment wherein the supercritical carbon dioxide fluid contains a silicon-containing chemical.

[Claim 22] The method according to claim 21, wherein the alcohol comprises methanol, ethanol, propanol, or butanol, or a combination of two or more thereof.

[Claim 23] The method according to claim 21, wherein the silicon-containing chemical comprises hexamethyldisilane, hexamethyldisilazane, dimethylsilyldiethylamine, tetramethyldisilazane, trimethylsilyldimethylamine, dimethylsilyldimethylamine, trimethylsilyldiethylamine, bis-trimethylsilyl-urea, bis(dimethylamino)methyl silane, bis(dimethylamino)dimethyl silane, dimethylaminopentamethyldisilane, or dimethylaminodimethyldisilane, or a combination of two or more thereof.

[Claim 24] The method according to claim 14, wherein the fluoro-carbon film comprises a nitrated fluoro-carbon film.

[Claim 25] The method according to claim 14, further comprising:

depositing a metal-containing film onto the treated surface of the fluoro-carbon film, wherein the surface termination improves adhesion of the metal-containing film to the fluoro-carbon film.

[Claim 26] The method according to claim 25, wherein the metal-containing film comprises tantalum.